

## **Descriptive Summary of the Changes in Coastal Chesapeake Bay, Virginia, September 21, 1984, to October 12, 1989**

At over 1 million acres, transitions between cultivated land and grassland constituted the greatest change detected by the C-CAP land cover analysis in the Chesapeake Bay region. These large-scale transitions represented cyclical cropping patterns as farmers alternated fields between cover crops and pasture.

Forestry transitions represented the second largest change component detected by the C-CAP land cover analysis. Forest changes in Chesapeake Bay were largely a component of human activities as deciduous and mixed forests were cleared for human development. This was evidenced by large transformations, with more than 211,000 acres of forest cover converted to grassland, 39,000 acres changed to cultivated land, and more than 35,000 acres directly transformed to high and low intensity development.

In close proximity to the Washington, D.C., area, the region was under intense development pressure as people moved out of the city. This was extremely evident on the Delmarva Peninsula, which incorporates parts of Delaware, Maryland and Virginia. Here many cleared forest areas served as transitional land cover, i.e., those characterized by grassland and cultivated land, until they were developed. Over 56,000 acres of combined forest, grassland, and cultivated land were directly converted to high intensity development, while over 52,000 acres were converted to low intensity development. High intensity development or urbanization reflects the direct transformation of forest, grassland, or cultivated land to intense development, which includes commercial areas, paved highways, parking lots, and building structures in close proximity to each other. Low intensity developed or suburban development usually has less of an impact on areas as typically 20 to 50 percent of the vegetative cover remains in residential neighborhoods through the incorporation of trees, large yards, parks, and other open spaces.

Below are three tables. The first two tables contain a data summary for the time 1 and time 2 images. These images were used to create the change image and their tables include; land cover classes, the number of pixels present in each class, and their corresponding values in acres.

The third table is a complete change matrix for time 1 and time 2 images and includes a smaller, generalized table, which groups similar classes together. Table three compares each class from time 1 to time 2 and illustrates the change that took place between classes. The table presents the total acres for each class, the total percent that each class represents, the total acres that changed, and the percent of change they represent.

## Tabular Summary: Chesapeake Bay, Virginia September 21, 1984

|    | CLASSES                        | PIXELS          | ACRES           | PERCENT        |
|----|--------------------------------|-----------------|-----------------|----------------|
| 0  | Background                     | 0               | 0               | 0.00%          |
| 1  | Unclassified                   | 0               | 0               | 0.00%          |
| 2  | High Intensity Developed       | 1988083         | 442138          | 2.07%          |
| 3  | Low Intensity Developed        | 3269108         | 727030          | 3.40%          |
| 4  | Cultivated Land                | 14496359        | 3223902         | 15.10%         |
| 5  | Grassland                      | 10876062        | 2418770         | 11.33%         |
| 6  | Deciduous Forest               | 18734294        | 4166393         | 19.51%         |
| 7  | Evergreen Forest               | 4008981         | 891573          | 4.17%          |
| 8  | Mixed Forest                   | 5487827         | 1220459         | 5.71%          |
| 9  | Scrub/Shrub                    | 2581212         | 574046          | 2.69%          |
| 10 | Palustrine Forested Wetland    | 3717327         | 826711          | 3.87%          |
| 11 | Palustrine Scrub/Shrub Wetland | 0               | 0               | 0.00%          |
| 12 | Palustrine Emergent Wetland    | 100448          | 22339           | 0.10%          |
| 13 | Estuarine Forested Wetland     | 0               | 0               | 0.00%          |
| 14 | Estuarine Scrub/Shrub Wetland  | 0               | 0               | 0.00%          |
| 15 | Estuarine Emergent Wetland     | 2560190         | 569371          | 2.67%          |
| 16 | Unconsolidated Shore           | 61813           | 13747           | 0.06%          |
| 17 | Bare Land                      | 89406           | 19883           | 0.09%          |
| 18 | Water                          | 28061281        | 6240659         | 29.22%         |
| 19 | Palustrine Aquatic Bed         | 0               | 0               | 0.00%          |
| 20 | Estuarine Aquatic bed          | 0               | 0               | 0.00%          |
| 21 | Tundra                         | 0               | 0               | 0.00%          |
| 22 | Snow/Ice                       | 0               | 0               | 0.00%          |
|    | <b>TOTALS</b>                  | <b>96032391</b> | <b>21357021</b> | <b>100.00%</b> |

## Tabular Summary: Chesapeake Bay, Virginia, October 12, 1989

|    | CLASSES                        | PIXELS          | ACRES           | PERCENT        |
|----|--------------------------------|-----------------|-----------------|----------------|
| 0  | Background                     | 0               | 0               | 0.00%          |
| 1  | Unclassified                   | 0               | 0               | 0.00%          |
| 2  | High Intensity Developed       | 2231657         | 496307          | 2.31%          |
| 3  | Low Intensity Developed        | 3531828         | 785457          | 3.65%          |
| 4  | Cultivated Land                | 12189712        | 2710918         | 12.60%         |
| 5  | Grassland                      | 13720137        | 3051275         | 14.19%         |
| 6  | Deciduous Forest               | 18563674        | 4128448         | 19.19%         |
| 7  | Evergreen Forest               | 3776065         | 839774          | 3.90%          |
| 8  | Mixed Forest                   | 5084643         | 1130794         | 5.26%          |
| 9  | Scrub/Shrub                    | 2664698         | 592613          | 2.76%          |
| 10 | Palustrine Forested Wetland    | 3750208         | 834024          | 3.88%          |
| 11 | Palustrine Scrub/Shrub Wetland | 0               | 0               | 0.00%          |
| 12 | Palustrine Emergent Wetland    | 90486           | 20124           | 0.09%          |
| 13 | Estuarine Forested Wetland     | 0               | 0               | 0.00%          |
| 14 | Estuarine Scrub/Shrub Wetland  | 0               | 0               | 0.00%          |
| 15 | Estuarine Emergent Wetland     | 2629323         | 584745          | 2.72%          |
| 16 | Unconsolidated Shore           | 78597           | 17479           | 0.08%          |
| 17 | Bare Land                      | 86693           | 19280           | 0.09%          |
| 18 | Water                          | 28324288        | 6299150         | 29.28%         |
| 19 | Palustrine Aquatic Bed         | 0               | 0               | 0.00%          |
| 20 | Estuarine Aquatic Bed          | 0               | 0               | 0.00%          |
| 21 | Tundra                         | 0               | 0               | 0.00%          |
| 22 | Snow/Ice                       | 0               | 0               | 0.00%          |
|    | <b>TOTALS</b>                  | <b>96722009</b> | <b>21510388</b> | <b>100.00%</b> |

Change Matrix and Tabular Summary: Chesapeake Bay, Virginia from September 21, 1984 to October 12, 1989

|    | FROM / TO                        | High Intensity Developed | Low Intensity Developed | Cultivated Land | Grassland | Deciduous Forest | Evergreen Forest | Mixed Forest | Scrub/Shrub | Palustrine Forested Wetland | Palustrine Scrub/Shrub Wetland | Palustrine Emergent Wetland | Estuarine Forested Wetland | Estuarine Scrub/Shrub Wetland | Estuarine Emergent Wetland | Unconsolidated Shore | Bare Land | Water     | Palustrine Aquatic Bed | Estuarine Aquatic Bed | Tundra | Snowice | Total Acres | Changed |                                |
|----|----------------------------------|--------------------------|-------------------------|-----------------|-----------|------------------|------------------|--------------|-------------|-----------------------------|--------------------------------|-----------------------------|----------------------------|-------------------------------|----------------------------|----------------------|-----------|-----------|------------------------|-----------------------|--------|---------|-------------|---------|--------------------------------|
| 2  | High Intensity Developed         | 424837                   | 10669                   | 2615            | 2370      | 436              | 48               | 38           | 272         | 144                         | 0                              | 33                          | 0                          | 0                             | 288                        | 60                   | 113       | 217       | 0                      | 0                     | 0      | 0       | 442,137     | 17,300  | High Intensity Developed       |
| 3  | Low Intensity Developed          | 3839                     | 714369                  | 1248            | 4788      | 1139             | 52               | 99           | 828         | 5475                        | 0                              | 23                          | 0                          | 0                             | 140                        | 22                   | 16        | 126       | 0                      | 0                     | 0      | 0       | 727,030     | 12,661  | Low Intensity Developed        |
| 4  | Cultivated Land                  | 18181                    | 9754                    | 2317640         | 817666    | 24901            | 1655             | 2134         | 21643       | 5475                        | 0                              | 164                         | 0                          | 0                             | 3371                       | 152                  | 207       | 958       | 0                      | 0                     | 0      | 0       | 3,223,901   | 906,261 | Cultivated Land                |
| 5  | Grassland                        | 21475                    | 22604                   | 319924          | 1999940   | 34936            | 3039             | 6671         | 39630       | 5402                        | 0                              | 163                         | 0                          | 0                             | 2794                       | 84                   | 963       | 2046      | 0                      | 0                     | 0      | 0       | 2,419,771   | 459,731 | Grassland                      |
| 6  | Deciduous Forest                 | 11315                    | 11761                   | 18104           | 80762     | 3979970          | 2491             | 11247        | 33324       | 14197                       | 0                              | 51                          | 0                          | 0                             | 2023                       | 31                   | 147       | 967       | 0                      | 0                     | 0      | 0       | 4,166,389   | 186,419 | Deciduous Forest               |
| 7  | Evergreen Forest                 | 1182                     | 2717                    | 6262            | 46542     | 6888             | 816368           | 1249         | 7327        | 2460                        | 0                              | 13                          | 0                          | 0                             | 323                        | 2                    | 14        | 226       | 0                      | 0                     | 0      | 0       | 891,573     | 75,205  | Evergreen Forest               |
| 8  | Mixed Forest                     | 3627                     | 2978                    | 10802           | 69342     | 19627            | 2078             | 1091150      | 14911       | 4758                        | 0                              | 18                          | 0                          | 0                             | 581                        | 4                    | 35        | 350       | 0                      | 0                     | 0      | 0       | 1,220,461   | 129,311 | Mixed Forest                   |
| 9  | Scrub/Shrub                      | 2016                     | 2552                    | 11031           | 35400     | 34837            | 5871             | 8606         | 466118      | 6522                        | 0                              | 65                          | 0                          | 0                             | 511                        | 5                    | 67        | 451       | 0                      | 0                     | 0      | 0       | 574,046     | 107,936 | Scrub/Shrub                    |
| 10 | Palustrine Forested Wetland      | 664                      | 991                     | 3431            | 14825     | 7583             | 1595             | 1835         | 4630        | 787061                      | 0                              | 139                         | 0                          | 0                             | 2764                       | 9                    | 30        | 855       | 0                      | 0                     | 0      | 0       | 626,711     | 39,660  | Palustrine Forested Wetland    |
| 11 | Palustrine Scrub/Shrub Wetland   | 0                        | 0                       | 0               | 0         | 0                | 0                | 0            | 0           | 0                           | 0                              | 0                           | 0                          | 0                             | 0                          | 0                    | 0         | 0         | 0                      | 0                     | 0      | 0       | 0           | 0       | Palustrine Scrub/Shrub Wetland |
| 12 | Palustrine Emergent Wetland      | 50                       | 33                      | 189             | 512       | 74               | 12               | 6            | 36          | 79                          | 0                              | 18787                       | 0                          | 0                             | 2004                       | 28                   | 0         | 527       | 0                      | 0                     | 0      | 0       | 22,339      | 3,563   | Palustrine Emergent Wetland    |
| 13 | Estuarine Forested Wetland       | 0                        | 0                       | 0               | 0         | 0                | 0                | 0            | 0           | 0                           | 0                              | 0                           | 0                          | 0                             | 0                          | 0                    | 0         | 0         | 0                      | 0                     | 0      | 0       | 0           | 0       | Estuarine Forested Wetland     |
| 14 | Estuarine Scrub/Shrub Wetland    | 0                        | 0                       | 0               | 0         | 0                | 0                | 0            | 0           | 0                           | 0                              | 0                           | 0                          | 0                             | 0                          | 0                    | 0         | 0         | 0                      | 0                     | 0      | 0       | 0           | 0       | Estuarine Scrub/Shrub Wetland  |
| 15 | Estuarine Emergent Wetland       | 716                      | 443                     | 1564            | 2266      | 904              | 103              | 79           | 502         | 693                         | 0                              | 338                         | 0                          | 0                             | 560383                     | 147                  | 354       | 880       | 0                      | 0                     | 0      | 0       | 569,370     | 8,987   | Estuarine Emergent Wetland     |
| 16 | Unconsolidated Shore             | 77                       | 16                      | 35              | 26        | 7                | 3                | 0            | 3           | 9                           | 0                              | 22                          | 0                          | 0                             | 63                         | 13323                | 34        | 131       | 0                      | 0                     | 0      | 0       | 13,747      | 424     | Unconsolidated Shore           |
| 17 | Bare Land                        | 477                      | 70                      | 602             | 488       | 6                | 5                | 1            | 32          | 4                           | 0                              | 4                           | 0                          | 0                             | 470                        | 218                  | 19119     | 2393      | 0                      | 0                     | 0      | 0       | 19,883      | 4,770   | Bare Land                      |
| 18 | Water                            | 2698                     | 1204                    | 1063            | 1253      | 974              | 206              | 96           | 274         | 508                         | 0                              | 278                         | 0                          | 0                             | 5638                       | 3378                 | 2135      | 6220700   | 0                      | 0                     | 0      | 0       | 6,240,661   | 19,961  | Water                          |
| 19 | Palustrine Aquatic Bed           | 0                        | 0                       | 0               | 0         | 0                | 0                | 0            | 0           | 0                           | 0                              | 0                           | 0                          | 0                             | 0                          | 0                    | 0         | 0         | 0                      | 0                     | 0      | 0       | 0           | 0       | Palustrine Aquatic Bed         |
| 20 | Estuarine Aquatic Bed            | 0                        | 0                       | 0               | 0         | 0                | 0                | 0            | 0           | 0                           | 0                              | 0                           | 0                          | 0                             | 0                          | 0                    | 0         | 0         | 0                      | 0                     | 0      | 0       | 0           | 0       | Estuarine Aquatic Bed          |
| 21 | Tundra                           | 0                        | 0                       | 0               | 0         | 0                | 0                | 0            | 0           | 0                           | 0                              | 0                           | 0                          | 0                             | 0                          | 0                    | 0         | 0         | 0                      | 0                     | 0      | 0       | 0           | 0       | Tundra                         |
| 22 | Snowice                          | 0                        | 0                       | 0               | 0         | 0                | 0                | 0            | 0           | 0                           | 0                              | 0                           | 0                          | 0                             | 0                          | 0                    | 0         | 0         | 0                      | 0                     | 0      | 0       | 0           | 0       | Snowice                        |
|    | Total Acres                      | 491,415                  | 780,160                 | 2,694,509       | 3,035,279 | 4,112,481        | 833,525          | 1,123,311    | 589,722     | 827,653                     | 0                              | 20,096                      | 0                          | 0                             | 581,353                    | 17,460               | 19,228    | 6,230,827 | 0                      | 0                     | 0      | 0       | 15,136,320  |         | Total Acres                    |
|    | Percent of Total                 | 3.25%                    | 5.15%                   | 17.80%          | 20.05%    | 27.17%           | 5.51%            | 7.42%        | 3.90%       | 5.47%                       | 0.00%                          | 0.13%                       | 0.00%                      | 0.00%                         | 3.84%                      | 0.12%                | 0.13%     | 41.16%    | 0.00%                  | 0.00%                 | 0.00%  |         |             |         | Percent of Total               |
|    | Total Acres that Changed (Y2-Y1) | 49,278                   | 53,130                  | -529,392        | 616,508   | -53,908          | -58,048          | -97,150      | 15,676      | 942                         | 0                              | -2,243                      | 0                          | 0                             | 11,983                     | 3,713                | -655      | -8,634    | 0                      | 0                     | 0      | 0       | 1,972,170   |         | Total Acres that Changed       |
|    | Percent Change                   | 11.15%                   | 7.31%                   | -16.42%         | 25.49%    | -1.29%           | -6.51%           | -7.96%       | 2.73%       | 0.11%                       | 0                              | -10.64%                     | 0                          | 0                             | 2.10%                      | 27.01%               | -3.30%    | -0.16%    | 0                      | 0                     | 0      | 0       | 13.03%      |         | Percent Change                 |

| FROM / TO                   | Developed | Cultivated | Grassland | Forested  | Scrub/Shrub | Wetlands  | Bare   | Water     | Total Acres | Changed   |             |
|-----------------------------|-----------|------------|-----------|-----------|-------------|-----------|--------|-----------|-------------|-----------|-------------|
| Developed                   | 1,153,713 | 3,863      | 7,157     | 2,296     | 1,099       | 968       | 212    | 343       | 1,169,651   | 15,938    | Developed   |
| Cultivated                  | 27,935    | 2,317,640  | 817,666   | 34,165    | 21,643      | 9,010     | 360    | 958       | 3,229,377   | 911,737   | Cultivated  |
| Grassland                   | 44,080    | 319,924    | 1,959,040 | 50,048    | 39,530      | 8,359     | 1,047  | 2,046     | 2,424,173   | 465,133   | Grassland   |
| Forested                    | 35,294    | 38,598     | 211,470   | 6,760,856 | 60,392      | 24,425    | 272    | 2,299     | 7,123,646   | 372,790   | Forested    |
| Scrub/Shrub                 | 4,570     | 11,031     | 35,400    | 55,836    | 466,110     | 7,097     | 72     | 451       | 580,568     | 114,458   | Scrub/Shrub |
| Wetlands                    | 2,897     | 5,184      | 17,603    | 12,289    | 5,369       | 1,372,248 | 568    | 2,262     | 1,418,420   | 46,173    | Wetlands    |
| Bare                        | 639       | 638        | 514       | 35        | 35          | 572       | 28,687 | 2,524     | 33,644      | 4,957     | Bare        |
| Water                       | 4,162     | 1,053      | 498       | 1,783     | 274         | 6,424     | 5,510  | 6,230,700 | 6,240,404   | 19,704    | Water       |
| Total Acres                 | 1,273,230 | 2,697,940  | 3,049,338 | 6,907,310 | 594,552     | 1,429,103 | 36,727 | 6,231,682 | 15,136,320  | 1,950,889 | Total Acres |
| Percent of Total (Y2/Total) | 8.41%     | 17.82%     | 20.15%    | 45.63%    | 3.93%       | 9.44%     | 0.24%  | 41.17%    |             | 12.89%    |             |
| Total Change (Y2-Y1)        | 103,578   | -531,437   | 625,166   | -216,336  | 13,984      | 10,682    | 3,083  | -8,721    |             | 1,950,889 |             |
| Percent Change              | 8.86%     | -16.46%    | 25.79%    | -3.04%    | 2.41%       | 0.75%     | 9.17%  | -0.14%    |             | 12.89%    |             |